

TMDL IMPLEMENTATION TOOL BOX
WORKING DRAFT DOCUMENT

| Tools | Features/ Components | Status | Integration with Other Tools | Application/Examples |
|---|--|---|---|--|
| Phase I | | | | |
| Lake Tahoe Basin Watershed Model | Simulates hydrology and N, P and sediment concentrations from urban and vegetated land use categories (represented in a land use GIS layer specifically designed for water quality assessment and implementation planning) to estimate pollutant loading to the lake. Includes runoff from 184 sub-watersheds and nine representative intervening zones. | Phase I product with first iteration nearing completion. Will be updated during TMDL Implementation, as necessary to incorporate new info (e.g. land use layer improvements). | Watershed Model output will be input to the Lake Clarity Model. Reconstructed meteorological data, stream channel erosion estimates, and land use GIS layers are input to assist in model calibration. Watershed Model has the capability to integrate all pollutant types associated with surface runoff | Land use characteristics can be changed to simulate various scenarios and their effect on pollutant loading on a basin-wide scale. Prioritization of improvement projects can be based upon amount and type of pollutant loading. Scenarios can then be developed to evaluate the water quality benefit of specific applications and their location. |
| Lake Tahoe Clarity Model | Predicts lake clarity response based on loads provided by watershed model, groundwater inputs, and air deposition. Can be used in conjunction with the watershed model to evaluate effectiveness of selected control scenarios and the time required for lake response. | Phase I product with first iteration nearing completion. Will be updated during TMDL Implementation, as necessary to incorporate new info. | Watershed Model output, air deposition estimates, and groundwater loads are input to Lake Clarity Model. Reconstructed meteorological data also are input. Research conducted to better understand lake processes can be used within this model | Clarity Model will produce potential combinations of N, P and fine sediment loads that achieve desired clarity, informing Phase 2. Alternate loading scenarios, including reduced groundwater flux, air deposition and surface water runoff (represented by Watershed Model) will be run through Clarity Model to determine lake response. |
| GIS Based Land Use and Land Characteristic Layers | Includes updated TRPA Landuse Layer, IKONOS impervious surface information, vegetation maps, soil maps and all layers that are required for the variety of Tool Box models. | Phase I project completed. Additional modification currently being made for incorporation into future iterations of watershed model | Forms the foundation for hydrologic considerations within the Watershed Model. Will be used for future BMP modeling work and can currently be applied to BMP design and inventory. Will be of use for all types of efforts involving GIS | This landuse layer has incorporated significant impacts to hydrology (e.g. ski runs) and has been developed to specifically reflect hard coverage associated with land use types based upon the IKONOS evaluation of impervious cover |
| Inventory of Water Quality Projects | Database of projects implemented to control erosion and urban storm water runoff. To the extent possible, project area and location are being mapped using GIS. | Phase I project underway with first iteration nearing completion. Will be updated during TMDL Implementation, as necessary to incorporate new info. | Anticipated to be integrated into BMP Model and Watershed Model, using information from Load Reduction Estimation Methodologies and Load Reduction Matrix | Will be used to determine load reductions achieved by existing BMP projects, especially (initially) in intervening zones |

TMDL IMPLEMENTATION TOOL BOX
WORKING DRAFT DOCUMENT

| Tools | Features/ Components | Status | Integration with Other Tools | Application/Examples |
|--|--|--|--|---|
| Atmospheric Deposition and Transport Estimates, and Improved Air Emissions Inventory | Estimates of total deposition to Lake Tahoe and significant sources of N, P, and fine particles (incl. motor vehicle exhaust, road dust, and wood smoke). | Phase 1 project to be completed next spring | Provides input to Lake Clarity Model, to Load Reduction Matrix, and to Evaluation of New Technologies/Approaches | Provides basis for estimating benefits resulting from potential reduction strategies. |
| South Shore Groundwater Flow Model and Whole-Lake GW Load Estimates | Provides volume, rate and distribution of groundwater flux to Lake Tahoe along southern shore; N & P GW loading estimates lake-wide. | Phase 1 product; GW Model could eventually be expanded to entire lake shore. | Input to Lake Clarity Model | Ex: Could provide basis to estimate load reductions resulting from GW controls/remediation. |
| Reconstructed Meteorological Data | Provides precipitation, temperature, wind speed, relative humidity and radiation estimates for 3x3km grids throughout the Tahoe Basin, based on a reconstruction of 42 years (1958-2000) of recorded data. | Phase 1 product completed | Provides input to: <ul style="list-style-type: none"> · Watershed Model · Lake Clarity Model · BMP Model, etc, in combination with other available meteorological information | Provides refined meteorological estimates for hydrological modeling. |
| Stream Channel Erosion Evaluation and Modeling | Estimates the magnitude and location of stream channel erosion and inputs to the lake. | Basin-wide evaluation completed for Phase I. Modeling completed for Ward Creek, General Creek, and the Upper Truckee. Application is pending for SNPLMA Round 6 funding. | Output of stream channel erosion evaluations and model runs can be represented in the Watershed Model. Will be used to estimate the relative in-stream contribution of sediment originating from stream channel erosion. Input to Evaluation of New Technologies/Approaches. | Stream channel erosion contributions of pollutants can be evaluated as part of total loading. Can be used to evaluate benefits of stream restoration efforts and effectiveness of potential approaches. |
| Tahoe Integrated Information Management System | Clearinghouse of water quality information and TMDL Implementation Tools | Initial version on-line; to be supplemented with models described here. | Provides a centralized location for the transfer and use of tools developed as part of TMDL | Provides public/stakeholder access to tool box |

TMDL IMPLEMENTATION TOOL BOX
WORKING DRAFT DOCUMENT

| Tools | Features/ Components | Status | Integration with Other Tools | Application/Examples |
|--|---|--|---|---|
| Phase II | | | | |
| Load Reduction Estimation Methodologies | Will establish standardized methodologies for evaluating load reductions achievable from various BMPs or other pollution control mechanisms. Must be standardized such that master plans and load reduction assessments are developed in a consistent manner across the Basin. Goal is to use such a methodology to give EIP and other projects that include multiple BMPs a numeric load reduction value for N, P and fine sediment. | Phase 2 product. Draft Work Plan currently being completed with products scheduled for delivery over the next year. | Will allow projects to receive a load reduction credit using science-based techniques. Will be developed in conjunction with the Load Reduction Matrix. Results will be used in Watershed and BMP models. | Allows for evaluation of alternative load reduction strategies/scenarios, encourages project monitoring, and enables estimation methodologies to be improved as data are incorporated. Provides a standardized methodology to measure and estimate load reductions from WQ improvement projects and to enable consistent crediting toward load allocations. |
| Load Reduction Matrix | Spreadsheet listing pollutant load reduction measures and opportunities for all significant sources. Will serve as a reference location for best information on BMP effectiveness. Effectiveness data should be broadly agreed upon and will be updated by new monitoring data. LRM will also include data on BMP cost per unit effort, constraints and other factors. Initially it will serve as a central repository for GIS-based data on locations and opportunities for implementation of the various BMPs throughout the basin. | Phase 2 product planned. SNPLMA Round 5 and USEPA Targeted Watershed grants awarded. Draft Work Plans currently being developed. | Will combine results of past, current and future monitoring studies, analysis of new technologies, and all other BMP research into a single tool. Closely linked with load reduction estimates. will be linked to GIS database that identifies load reduction opportunities basin-wide (including expected BMP project drainage areas and land use characterization). | The LRM is the cornerstone of a process for basin-wide water quality management that can be beneficial to both implementers and agencies. By having agreed-to BMP effectiveness values, that are based on Tahoe field data and best professional judgment, an approach for project crediting can be formalized and load reduction strategies can be compared. |
| Evaluation of New Approaches/ Technologies | Will identify and evaluate new technologies and pollution control approaches, including: mitigation of airborne pollutants, advanced and/or centralized storm water treatment and hydrologic controls, BMP maintenance, and stream channel restoration. | Phase 2 product planned. SNPLMA Round 5 and USEPA Targeted Watershed grants awarded. Draft Work Plans currently being developed. | Viable new technologies and approaches will be incorporated into the Load Reduction Matrix and will have Load Reduction Estimation Methodologies developed for them. | Provides for innovative pollution control approaches and development of more comprehensive load reduction strategies. |

TMDL IMPLEMENTATION TOOL BOX
WORKING DRAFT DOCUMENT

| Tools | Features/ Components | Status | Integration with Other Tools | Application/Examples |
|---|--|--|--|--|
| Water Quality Trading (WQT) Feasibility Study | Determines feasibility of WQT as a means to assist in TMDL implementation. Includes survey of other WQT systems and development of options for WQT in Lake Tahoe Basin, including proposals for: units of trade; trading areas; trading ratios; and tracking, crediting, banking and transfers of load reductions. | Phase 2 product planned. SNPLMA Round 5 and USEPA Targeted Watershed grants awarded. Draft Work Plans currently being developed. | Takes into account and could utilize all other TMDL implementation tools, especially Load Reduction Matrix, Estimation Methodologies, Tracking System, Watershed and BMP Models, and THIMS. | If feasible and agreed upon by stakeholders, could increase efficiency of TMDL implementation. |
| Pollutant Load Reduction Tracking System | Will establish database for tracking pollutant reduction efforts. Primary objective is to develop a monitoring system for crediting and field performance that can be used to evaluate EIP progress. | Phase 2 product planned | Will provide future inputs to Watershed and Lake Clarity Models to track effectiveness of TMDL Implementation. Will provide feedback on/validation of Load Reduction Estimating Models/Methodologies (#4 above). | “Credits” individual BMP projects or load reduction approaches. Enables mid-course adjustment, if necessary, of TMDL and/or WLA/LA and/or Implementation Plan. |
| Proposed | | | | |
| BMP Model | Will simulate hydrologic and pollutant-generation impacts of specific stormwater BMP projects. To be developed as a module for direct incorporation into Watershed Model | SNPLMA Round 6 application pending. | Incorporates BMP effectiveness estimations into a project siting and design tool that optimizes BMP selection for storm water treatment. Can be used in combination with local effectiveness data, Load Reduction Estimation Methodologies, and BMP Model. | Can be used to develop storm water control strategies and to estimate results and effectiveness of implementation scenarios at the basin-wide scale. Combined use of the Watershed/BMP Model and the Clarity Model will allow water quality planners to determine the quantitative impact of various EIP strategies. |
| Storm Water Master Plans | Development of regional/jurisdictional plans for control and treatment of stormwater. | Proposed project for inclusion in the tool box. | Will utilize a significant number of tools within the Tool Box. | Will show how, where, and when pollutants are proposed to be treated within a specified area, i.e. how will the load reductions targets be achieved through BMP implementation. |
| Urban Hydrology Model | Will provide site-specific hydrology information for project design. Must be standardized such that projects are designed from a consistent set of parameters and are equally applied by individual implementers. | Phase 2 product planned for a feasibility evaluation with a SNPLMA Round 5 grant. SNPLMA Round 6 application pending that will fund technical work on this tool. | Integration with the Watershed Model will allow for spatially refined modeling of hydrology and pollutant transport within highly urbanized areas. Will be linked to BMP Model to assist with design and performance requirements. | Stormwater BMP project design, scenario evaluation and development of stormwater master plans. |
| TBD | Space reserved for additional projects | | | |
| TBD | | | | |
| TBD | | | | |